



FEB 3 10 40 AM '97

January 31, 1997

Mr. Andrew Shively
Vermont ANR/DEC
Waste Management Division
103 South Main Street / West Building
Waterbury, VT 05671-0404

RE: Investigation of Suspected Subsurface Petroleum Contamination at Mad River Glen Ski Area, Route 17, Fayston, VT (VTDEC Site # 96-2061)

Dear Mr. Shively:

Please find enclosed a summary report for the site investigation conducted for the Mad River Glen Cooperative. This report is forwarded to the Vermont Department of Environmental Conservation (VTDEC), on behalf of Mad River Glen Cooperative, Inc. Please contact me if you have any questions or comments.

Sincerely,

Erik C. Sandblom
Engineer

Enclosure

cc: Bob Mazza, Mad River Glen Coop.

**REPORT ON THE INVESTIGATION
OF SUSPECTED SUBSURFACE
PETROLEUM CONTAMINATION**

JANUARY 31, 1997

**Site Location:
MAD RIVER GLEN SKI AREA
ROUTE 17
FAYSTON, VERMONT**

VTDEC SITE #96-2061

Prepared For:

**MAD RIVER GLEN COOPERATIVE, INC.
P.O. BOX 1089
FAYSTON, VERMONT 05673**

Prepared By:



P.O. Box 943 / 19 Commerce Street Williston, VT 05495 (802) 865-4288

FEB 3 10 45 AM '97

TABLE OF CONTENTS

I.	INTRODUCTION	1
II.	SITE BACKGROUND	
	A. Site History	1
	B. Site Description	2
III.	INVESTIGATIVE PROCEDURES	
	A. Monitoring Well and Soil Boring Installation	2
	B. Determination of Groundwater Flow Direction and Gradient	4
	C. Groundwater Sample Collection and Analysis	4
	D. Water Supply Well Sample Collection and Analysis	5
	E. Inspection of Stockpiled Soils	5
	F. Sensitive Receptor Risk Assessment	5
IV.	CONCLUSIONS	7
V.	RECOMMENDATIONS	7

APPENDICES

A.	SITE MAPS	
	1) Site Location Map	
	2) Site Area Sketch	
	3) Site Map	
	4) Groundwater Contour Map	
B.	MONITORING WELL / SOIL BORING LOGS	
C.	GROUNDWATER QUALITY SUMMARY DATA	
D.	SOIL SAMPLE ANALYSIS DATA SUMMARY	
E.	GROUNDWATER LIQUID LEVEL DATA	
F.	LABORATORY ANALYSIS REPORTS	

I. INTRODUCTION

The following report summarizes an investigation of suspected subsurface petroleum contamination that was conducted at Mad River Glen Ski Area, located on Route 17 in Fayston, Vermont. This work has been conducted by Griffin International, Inc. (Griffin) for Mad River Glen Cooperative, Inc. The Vermont Department of Environmental Conservation (VTDEC) requested that this work be completed in a letter addressed to Mr. Bob Mazza, of Mad River Glen Cooperative, Inc., from Mr. Chuck Schwer, of the VTDEC, dated October 22, 1996. All work at the site was conducted in accordance with the October 29, 1996 Work Plan and Cost Estimate prepared by Griffin, which was approved by the VTDEC in a letter from Mr. Andrew Shively, of the VTDEC, to Mr. Mazza, dated November 13, 1996.

Work conducted at the site includes the installation of four groundwater monitoring wells and one soil boring, and the subsequent collection and analysis of soil and groundwater samples. A groundwater contour map was generated for the vicinity of the monitoring wells. Water samples were collected for analysis from three on-site water supply wells. In addition, a sensitive receptor risk assessment was conducted to assess the risk that subsurface petroleum contamination at the site may pose to sensitive receptors in the area.

II. SITE BACKGROUND

A. Site History

On August 20, 1996, two underground storage tanks (USTs), both used to contain No. 2 fuel oil, were permanently closed and removed from the ground as part of routine UST system replacements. UST #1 was 3,000 gallons in capacity, and located along the northern edge of the Basebox Building (see Site Map in Appendix A). UST #2 was 630 gallons in capacity and located on the eastern side of the patrol building. Petroleum contamination was detected in soils surrounding UST #1 during the UST removal inspection conducted by Griffin. Approximately one cubic yard of petroleum contaminated soil was stockpiled and encapsulated in a polyethylene liner on-site. Residual petroleum contaminated soil containing 8 to 15 parts per million (ppm) volatile organic compounds (VOCs) as measured with a photo-ionization detector (PID) remained in the excavation due to buried power lines and the building foundation. VOCs were detected in soil in the excavation for UST #2 up to 110 ppm close to the water table. Approximately 14 cubic yards of petroleum contaminated soil from this excavation were stockpiled on-site in order to make room for the replacement UST.

As a result of the detected petroleum contamination in the subsurface at the site, the VTDEC requested that additional work be completed to further define the extent and degree of petroleum contamination in the vicinity of the two USTs. Mad River Glen Cooperative retained the services of Griffin to conduct the work requested by the VTDEC. A Work Plan and Cost Estimate, dated October 29, 1996, was sent to the VTDEC, with the approval of Mad River Glen Cooperative, Inc. The VTDEC approved the Work Plan and Cost Estimate in a letter dated November 13, 1996. This report summarizes the site investigation.

B. Site Description

Mad River Glen Cooperative, Inc. is located on the south side of Vermont Route 17 along the western edge of the Town of Fayston, Vermont (see Site Location Map in Appendix A). The property is operated as a ski area which includes several chair lifts, a restaurant / base lodge / ticket office (Basebox), a nursery, first aid / ski patrol, administrative offices, ski rental, retail store, and a maintenance garage. The only public utilities at the site are telephone and electric power. Four drilled water supply wells are located on-site which supply water to the ski area. Two wells (SW-1 and SW-2) are located on the north side of the Basebox, adjacent to the main Mill Brook tributary. A third well (Nursery Well, or SW-3) is located near the east side of the Cricket Club Nursery daycare. The fourth well is located on an adjacent property owned by Richard Dale (Hutch Well) to the north.

Nearly the entire subject property consists of natural terrain. The property is abutted primarily by residences, many of which are used seasonally. Sugarbush Ski Area borders Mad River Glen to the south. The western border of the property is approximated by the ridge of Stark Mountain. Approximately 50 residential lots are situated near the northern border of the property along Route 17.

The property is drained by several streams on the mountain which are tributaries of Mill Brook. These streams generally flow from west to east toward the base lodge area. The 1970 *Surficial Geologic Map of Vermont* indicates that the overburden at the subject property consists of glacial till. Overburden thicknesses in the area are likely less than 50 feet. Bedrock in the area is mapped primarily as schist of the Underhill Formation, according to the 1961 *Centennial Geologic Map of Vermont*. Groundwater flow direction in the base area is to the north, toward Mill Brook. The water table beneath the base area of the property varies from 2.5 to 12.0 feet below grade.

III. INVESTIGATIVE PROCEDURES

A. Monitoring Well and Soil Boring Installation

On December 3 and 4, 1996, four groundwater monitoring wells (MW-1, MW-2, MW-3, and MW-4) were installed adjacent to and in the vicinity of the former location of UST #2, and a soil boring was drilled in the presumed downgradient direction from the former location of UST #1. The locations of the wells and soil boring are displayed on the Site Map in Appendix A. The company conducting the drilling services was Green Mountain Boring, Inc. of Barre, Vermont. All drilling and well installation activities were conducted under the direct supervision of a Griffin engineer.

Monitoring wells and the soil boring were advanced with the use of a 4.25 inch inner diameter hollow stem auger drill rig. Undisturbed soil samples were collected with the use of a

split spoon sampler at a minimum of five foot intervals. Soil types from each boring were classified and logged in detail. Each soil sample was screened in the field for VOCs with a properly calibrated H-Nu HW-101 PID. All wells were developed by hand using a bailer immediately following installation.

The wells were constructed of factory slotted, two-inch diameter PVC pipe with a slot size of 0.010 inch and a schedule 40 PVC riser. The length of the screen and riser varied depending on the depth of the well and the location of the water table in the bore hole. Specific well construction details are displayed in the detailed well logs included in Appendix B. All wells were installed in accordance with Griffin protocols which comply with State and industry standards.

Soil encountered in the soil borings for all four monitoring wells consisted of dry, brown, fine sand and silt with a trace of fine gravel from the ground surface to approximately five feet below grade. Beyond five feet, soil typically consisted of medium to coarse sand and gravel with a trace of silt. Clay was encountered in samples collected from 10 to 12 feet below grade in the soil borings for MW-2 and MW-3. The water table in these two monitoring wells was detected at a significantly shallower depth than the other two monitoring wells, on the day of well installation. The measured water table depths for MW-1, MW-2, MW-3, and MW-4 were at 8.0 feet, 4.0 feet, 2.5 feet, and 6.5 feet below grade, respectively.

Dry, brown, medium to fine, sand and silt with a trace of gravel was encountered from grade elevation to five feet below grade in the soil boring drilled in the vicinity of UST #1 (SB-1). From seven to eight feet below grade, saturated medium to fine gravel till and silt was encountered over fine to medium gravel and very fine sand and silt. Crushed and whole rock till was encountered over saturated sand and silt from 11 to 13 feet below grade. The observed soil types are consistent with the glacial till description given on the *Surficial Geologic Map of Vermont*. Exploration was discontinued at 13 feet below grade. Although saturated soil samples were collected from seven to nine feet below grade, it is likely that the regional water table in the borehole is at 12 feet below grade. It is believed that the well consolidated, very fine sand and silt located at nine feet caused a perched water table in soil in this vicinity.

Maximum VOC concentrations detected in soil samples retrieved from the boreholes were 2.2 ppm at 10'-12' in MW-1, 6.0 ppm at 10'-12' in MW-2, 0.8 ppm at 5'-7' in MW-3, 2.1 ppm at 10'-10¼' in MW-4, and 0.2 ppm at 9'-11' and 13' in SB-1.

A soil sample was collected from SB-1 at 12 feet below grade, the approximate depth of the regional water table in the borehole. The saturated soil sample was laboratory analyzed for BTEX (benzene, toluene, ethyl benzene, xylenes) and MTBE (methyl tertiary butyl ether). Sample analysis results are summarized in Appendix D. According to the results of the analysis, no BTEX constituents were detected above a detection limit of 51 ppb (parts per billion), or 0.05 ppm, and MTBE was not detected in the sample above a detection limit of 551 ppb (0.55 ppm).

B. Determination of Groundwater Flow Direction and Gradient

The monitoring wells were allowed to stabilize for a period of approximately one week. On December 12, 1996, depth to water measurements were collected with the use of a Keck interface probe for all four site related wells. These measurements were subtracted from the top of casing elevations, which were determined relative to an arbitrary datum of 100 feet at the top of the casing for MW-1, to determine the water table elevation at each of the wells. From the monitoring well water table elevation data, the groundwater contours were interpolated onto the site map and the groundwater direction and gradient determined.

As displayed on the groundwater contour map included in Appendix A, the groundwater flow direction for December 12, 1996 in the vicinity of the monitoring wells, was generally to the north, toward the Mill Brook tributary, at a gradient of approximately 20%. This is considered to be an exceptionally steep hydraulic gradient; however, it is consistent with the relatively steep topography and high volume of surface water drainage to the Mill Brook tributary.

C. Groundwater Sample Collection and Analysis

Following depth to water data collection, samples of the groundwater were collected from all four of the site related monitoring wells. No free phase petroleum product was observed in any of the monitoring wells. All samples were analyzed for BTEX and MTBE, common constituents of petroleum contamination, per EPA Method 602. Results of the laboratory analyses for those wells sampled on this date are summarized in Appendix C.

According to the results of the analyses, a very low level of dissolved petroleum contamination was detected in the sample collected from monitoring wells MW-3 and MW-4. Xylenes were detected in the sample collected from MW-3 at a concentration of 2.3 ppb, and benzene and toluene were each detected at a trace below quantitation level, which was 1.0 ppb. Toluene was detected in the sample collected from MW-4 at a concentration of 1.1 ppb and benzene was detected at trace below quantitation level of 1.0 ppb. No compounds were detected in the analyses at concentrations at or above applicable state groundwater standards. No compounds tested for in the analyses were detected in monitoring wells MW-1 or MW-2.

All samples were collected according to Griffin's groundwater sampling protocol which complies with industry and state standards. A concentration of 1.1 ppb of toluene and a trace concentration of xylenes (TBQ<1) were detected in the trip blank sample. The source of this contamination has been traced to the distilled water used to prepare the blank. This problem with the distilled water has since been addressed by Griffin. The toluene and xylenes measurements for the monitoring wells are not likely compromised. No equipment blank was collected, as disposable bailers were used for sample collection. Results of the duplicate sample indicate that adequate quality assurance and quality control (QA/QC) were maintained during collection, transportation and analysis of the samples. All samples were analyzed within the specified holding times.

D. Water Supply Well Sample Collection and Analysis

Water samples were collected for analysis from three on-site water supply wells (SW-1, SW-2, and SW-3) on the day of groundwater sample collection. One sample was collected representative of both SW-1 and SW-2, as both wells are plumbed to the Basebox water distribution system. To collect individual samples from each well would require significant modification of the Basebox plumbing system, or well head access. The SW-1/SW-2 sample was collected from a sink in the kitchen of the cafeteria in the basebox. A second sample was collected from the drilled well that services the nursery and the patrol building (SW-3). This sample was collected from a sink located in the patrol building. Treatment systems are reportedly not connected to any of the sampled water supplies. No construction data is known regarding these three on-site supply wells, except that, according to site representatives, all wells are drilled.

All supply well samples were analyzed for BTEX and MTBE per EPA Method 602. The results of the sample analyses indicate that no compounds tested for in the analysis were detected in any of the samples collected from these water supplies.

E. Inspection of Stockpiled Soils

A total of approximately 15 cubic yards of petroleum contaminated soil from the excavation of UST #1 and UST #2 remain stockpiled on-site at the top of the practice slope (double chair lift line #4 on area sketch), located approximately 800 feet to the north of the base box. The stockpile is completely encapsulated in a polyethylene liner. Soil samples were not collected for field screening with a PID during drilling or groundwater sample collection, as the surface of the stockpile was frozen. According to the UST Removal Inspection Report prepared by Griffin in August of 1996, the stockpiled soil contained an average VOC concentration of 49 ppm at the time of the UST removals.

F. Sensitive Receptor Risk Assessment

A receptor risk assessment was conducted to identify any known or potential receptors of residual contamination detected at Mad River Glen Cooperative, Inc. A visual survey was conducted at the time of drilling and groundwater sample collection. Based on these observations, a determination of the potential risk to identified receptors was conducted based on source proximity, groundwater flow direction, and contaminant concentration levels. Interviews and historical research were also conducted as part of the survey.

Water Supplies

Four drilled supply wells service the water needs of the base area at the site. Two wells are located on the north side of the basebox building (SW-1 and SW-2), a third is located to the south of the nursery building (SW-3), and a fourth is located at the Hutch residential property to the east of the double No. 4 chair-lift, on the opposite side of the Mill Brook.

Given the separation distances between the Hutch well and the two former USTs, and given that the Hutch well is located on the opposite side of the Mill Brook from the two former USTs, this well is not likely at a significant risk of petroleum contamination impact from the two former USTs (UST #1 and UST #2). The two wells supplying the basebox are located within approximately 100 feet of UST #1, in a direction that is likely hydraulically upgradient or cross gradient. These wells are both drilled wells, presumably both installed into the bedrock aquifer. Given these assumptions, and that the level of petroleum contamination detected in the vicinity of the former UST is very low, the two basebox wells are not likely significantly at risk of petroleum contamination impact. According to sample analysis results, none of the petroleum compounds tested for as a part of this investigation were detected in SW-1, SW-2, or SW-3.

Surface Waters

The only identified surface water that could potentially be at risk from petroleum contamination at Mad River Glen Cooperative is the Mill Brook, which flows downgradient of both UST #1 and UST #2. However, based on the low level of dissolved contamination detected in the overburden at the site, and the separation distance between the river and the former USTs, it is not likely that the Mill Brook is at significant risk of impact by petroleum contamination from the former USTs. The banks of the river were inspected on the days of drilling and groundwater sample collection. No evidence of petroleum contamination impact (such as sheens on the water surface, stressed vegetation, stained soil, or petroleum odors) were observed. The banks of the river were covered with ice and snow at the time of inspection.

Buildings in the Vicinity

Several buildings are located in the vicinity of former UST #1 and UST #2, the closest of which are the basebox, located adjacent to UST #1 and the patrol building, located adjacent to UST #2. Both buildings are constructed upon concrete slab foundations which extend into site soils to create partial basements. Given the removal of petroleum contaminated soil in the vicinity of the USTs, and the very low level of petroleum contamination detected in soils and groundwater at the site, the majority of adsorbed petroleum contamination has likely been removed from the ground. Screening of the breathing space in the basements of the two buildings with a PID indicated that there were no VOCs above background levels. No complaints have been reported of petroleum odors within the building. Therefore, on-site buildings do not appear to be at risk of petroleum vapor impact.

IV. CONCLUSIONS

Based on currently available data regarding Mad River Glen Cooperative, located in Fayston, Vermont, the following conclusions are presented:

- 1) Very low concentrations of dissolved petroleum contamination have been detected in groundwater downgradient of a former fuel oil UST (UST #2) located near the ski patrol building at the subject property. Contamination levels detected at the site are well below applicable state groundwater standards. Some residual petroleum contamination may remain in the vadose zone in the immediate vicinity of UST #2; however, the majority of adsorbed petroleum contamination has most likely been removed, since no petroleum contaminants have been detected in groundwater from the monitoring well (MW-2) located directly adjacent to the UST.
- 2) The screening and analysis results of soil samples collected from a soil boring drilled directly adjacent to former fuel oil UST #1 at the subject property indicate that no significant petroleum contamination remains in the subsurface in this vicinity.
- 3) No identified sensitive receptors in the area are at significant risk of petroleum contamination impact due to the sufficient distance of receptors from the site and/or the very low levels of contamination detected at the site.
- 4) Approximately 15 cubic yards of petroleum contaminated soil are stockpiled and encapsulated in a polyethylene liner at the site. Current VOC concentrations in the pile have not been determined due to the frozen nature of the soils. Petroleum contamination levels within the stockpile are expected to reduce over time due to natural process of degradation.
- 5) Over time, the natural processes of dilution, dispersion, and biodegradation will reduce contaminant concentrations in the subsurface at Mad River Glen Cooperative to non-detect.

V. RECOMMENDATIONS

Based on the above conclusions, the following recommendations are presented concerning petroleum contamination detected in the subsurface at Mad River Glen Cooperative, Fayston, Vermont:

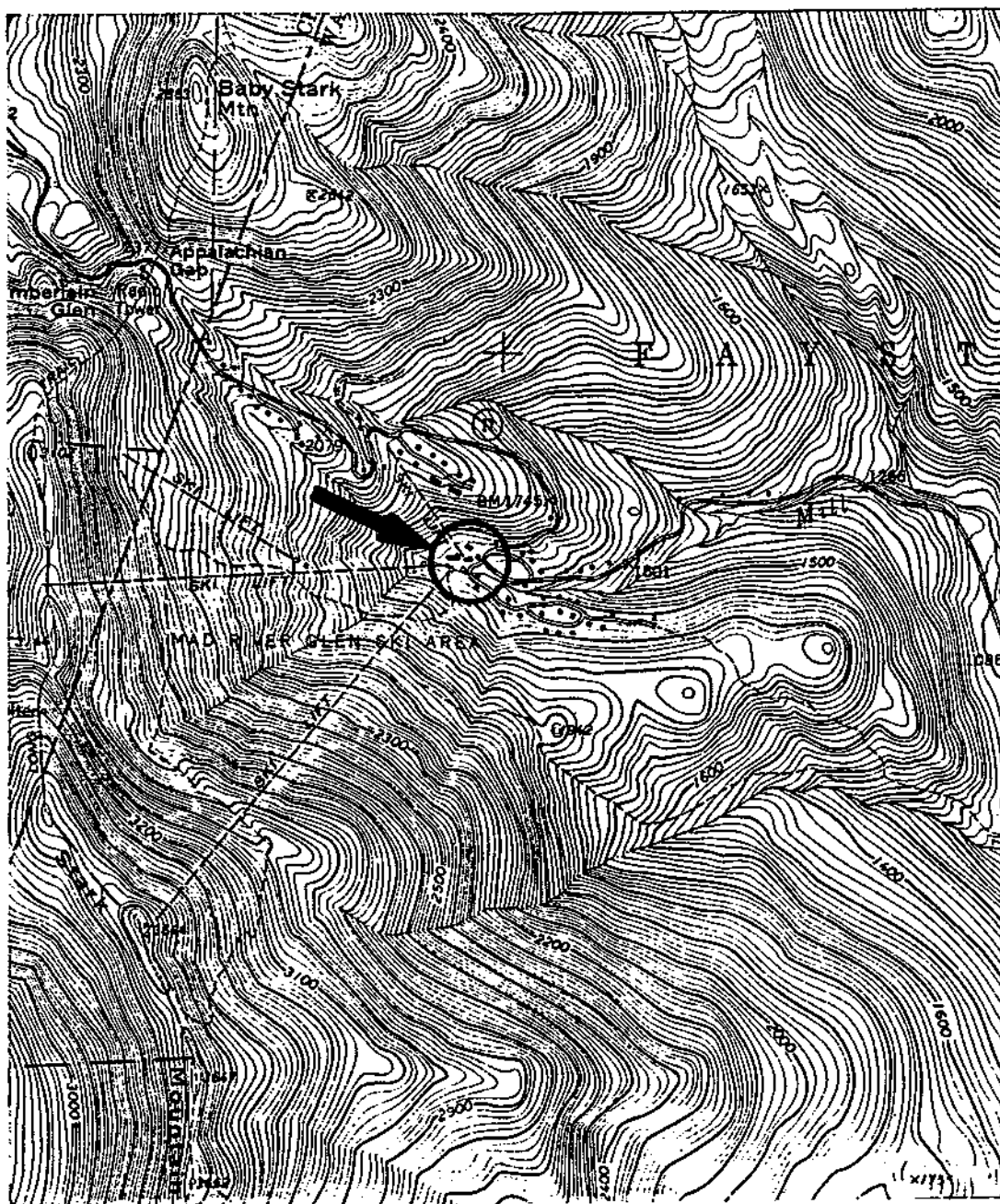
- 1) Based on the results of groundwater and soil sample analyses, only very low concentrations of benzene and xylenes were detected in groundwater at the site. These concentrations are below state groundwater standards. Based on this fact and given that no sensitive receptors appear to be at risk of petroleum contamination, no further subsurface work is warranted at this site.

- 2) The soil stockpile at the site will be screened for VOCs in the Spring of 1997, in accordance with the Work Plan, after it thaws, with a properly calibrated PID. Several soil samples will be collected from within the stockpile and screened in accordance with Griffin's Jar / Polyethylene Bag Headspace Analysis Protocol. The plastic covering should be routinely inspected and maintained. It may be necessary to re-pile the soil on a new liner every 12 months depending on the condition of the liner. This will also aid in the more efficient reduction of contaminants in the pile by adding oxygen to the soil. Further recommendations regarding petroleum contaminated stockpiled soils will be presented following screening.

APPENDIX A

SITE MAPS

- 1) Site Location Map**
- 2) Site Area Sketch**
- 3) Site Map**
- 4) Groundwater Contour Map**



JOB #: 11964945

SOURCE: USGS- MOUNT ELLEN, VERMONT QUADRANGLE



MAD RIVER GLEN COOPERATIVE

FAYSTON, VERMONT

SITE LOCATION MAP

DATE: 1/14/97

DWG. #: 1

SCALE: 1:24000

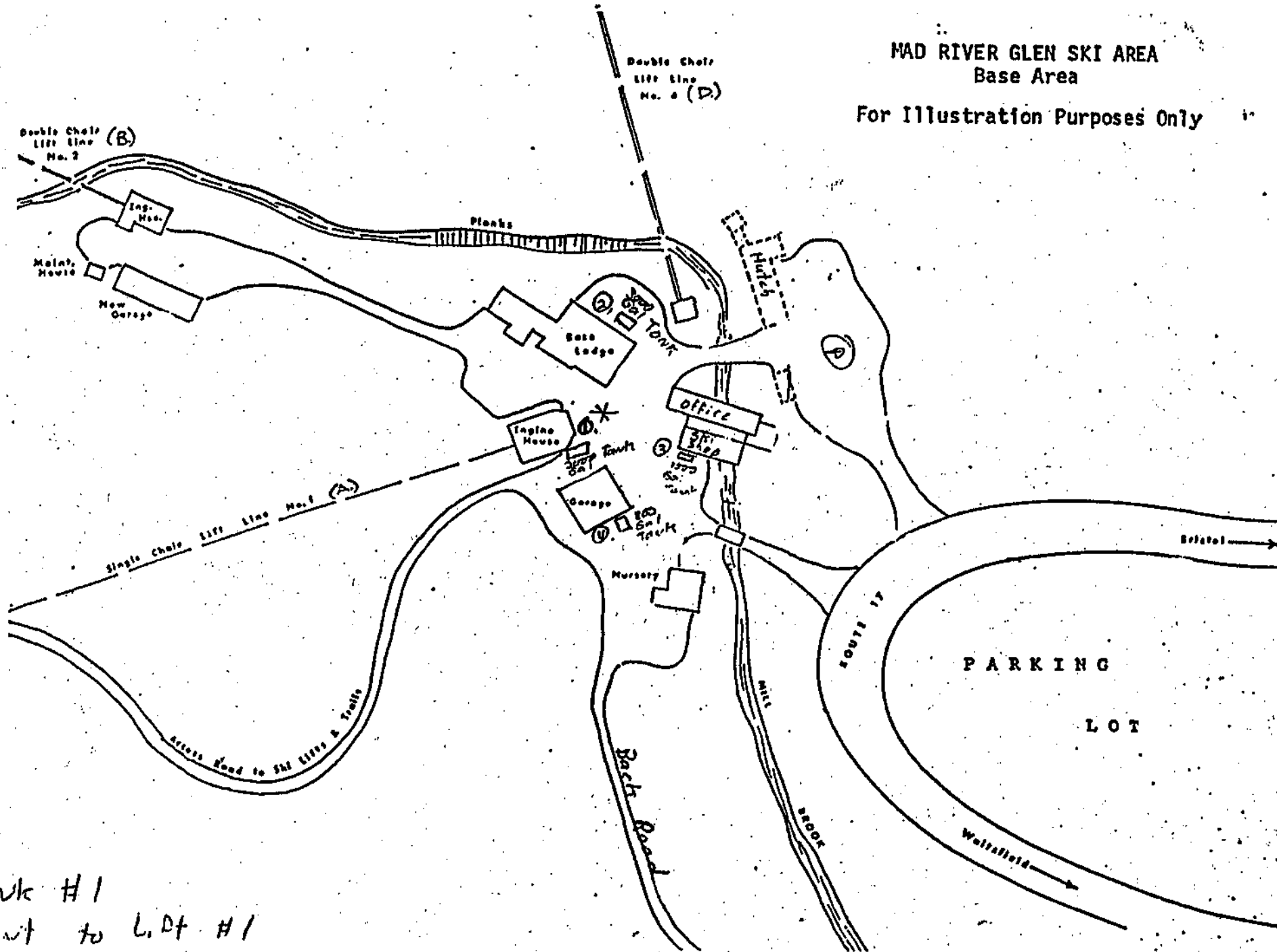
DRN.: SB

APP.: ES

2192

MAD RIVER GLEN SKI AREA Base Area

For Illustration Purposes Only



TANK #1
Adjacent to L.D. #1
West of Rt. 17



PLANKING

DOUBLE CHAIR
LIFT LINE

SW1
SW2

WATER TANK

UST1
SB1

BASEBOX

LOCATION OF EXISTING 1,000
GALLON GASOLINE UST.

OFFICE/RETAIL BUILDING
DECK
RENTALS BUILDING

SEPTIC FIELD

PARKING

VT. ROUTE 17

MILL BROOK
TRIBUTARY

MW4

MW3

DAYCARE

SW3

PATROL

MW1

UST2
MW2

INTERMITTENT STREAM

LEGEND

- MW2 MONITORING WELL
- SW2 SUPPLY WELL
- SB2 SOIL BORING
- UST2 UNDERGROUND STORAGE TANK

SINGLE CHAIR
LIFT LINE



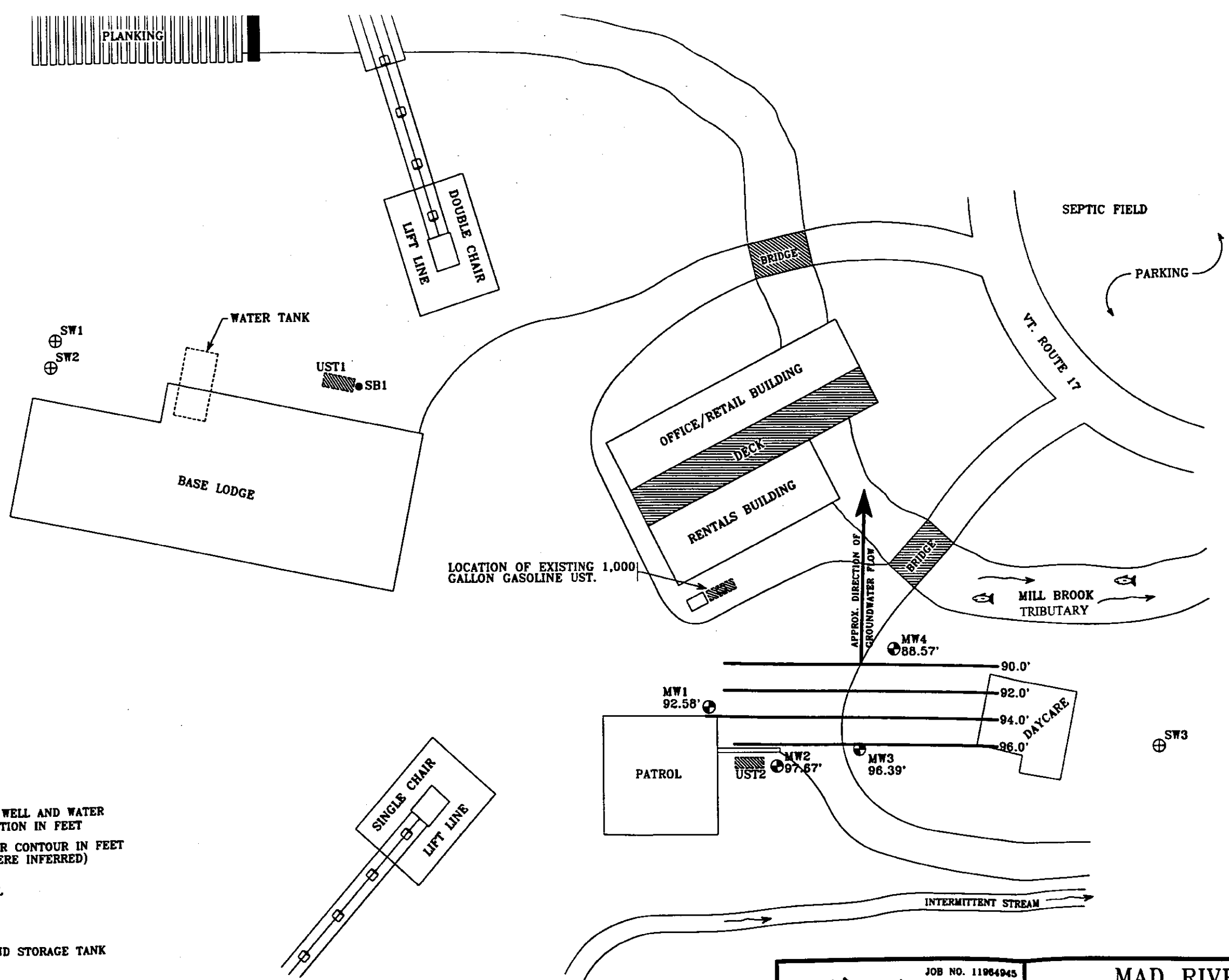
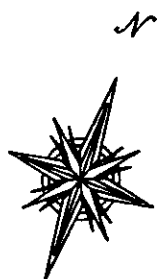
JOB NO. 11964945

**MAD RIVER GLEN
COOPERATIVE
FAYSTON, VERMONT**

SITE MAP

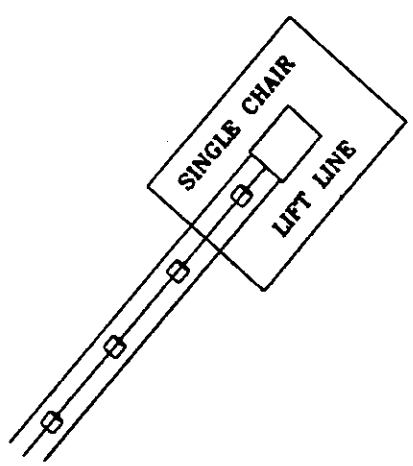
DATE: 1/27/97	DWG.#: 2	SCALE: 1"=40'	DRN.: SJB	APP.: ES
---------------	----------	---------------	-----------	----------

NOTE: LOCATIONS OF SOME BUILDINGS ARE APPROXIMATE.



LEGEND

- MW2 MONITORING WELL AND WATER TABLE ELEVATION IN FEET
- 94.0' GROUNDWATER CONTOUR IN FEET (DASHED WHERE INFERRED)
- SW2 SUPPLY WELL
- SW2 SOIL BORING
- UST2 UNDERGROUND STORAGE TANK



NOTE: LOCATIONS OF SOME BUILDINGS ARE APPROXIMATE.



JOB NO. 11964945

**MAD RIVER GLEN
COOPERATIVE**

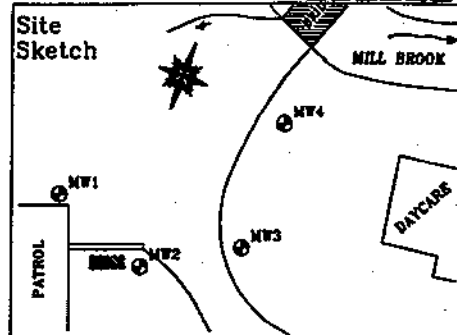
FAYSTON, VERMONT

**GROUNDWATER CONTOUR MAP
MEASUREMENT DATE: 12/12/96**

DATE: 1/27/97	DWG.#: 3	SCALE: 1"=40'	DRN.: SJB	APP.: ES
---------------	----------	---------------	-----------	----------

APPENDIX B

MONITORING WELL / SOIL BORING LOGS

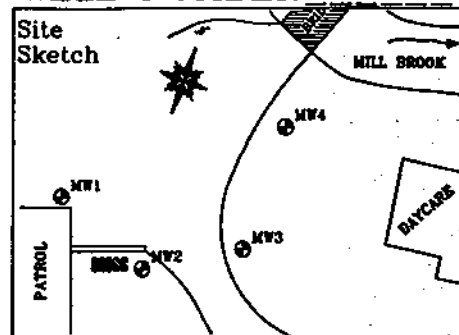
PROJECT MAD RIVER GLEN COOPERATIVELOCATION FAYSTON, VERMONTDATE DRILLED 12/3/96 TOTAL DEPTH OF HOLE 13.0'DIAMETER SCREEN DIA. 2" LENGTH 10.0' SLOT SIZE 0.010"CASING DIA. 2" LENGTH 2.0' TYPE sch 40 pvcDRILLING CO. GMB DRILLING METHOD HSADRILLER RON GARNEAU LOG BY E. SANDBLOMWELL NUMBER MW1

GRIFFIN INTERNATIONAL, INC

DEPTH IN FEET	WELL CONSTRUCTION	NOTES	BLOWS PER 6" OF SPOON & PID READINGS	DESCRIPTION/SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)	DEPTH IN FEET
0	ROAD BOX	LOCKING WELL CAP			0
1	CONCRETE				1
2	BENTONITE		0'-5' 1.8 ppm	Dark brown, fine to medium SAND and SILT, with coarse sand and fine gravel.	2
3	WELL RISER				3
4					4
5					5
6	SAND PACK		5'-7'- 4/8/13/56 0.7 ppm	Medium to coarse SAND with some silt and fine gravel.	6
7					7
8				8.0' WATER TABLE	8
9	WELL SCREEN				9
10					10
11			10'-12'- 106 2.2 ppm	Well graded fine, medium, coarse SAND with trace silt and some fine gravel.	11
12	BOTTOM CAP				12
13	UNDISTURBED NATIVE SOIL			BASE OF WELL AT 12.5' END OF EXPLORATION AT 13'	13
14					14
15					15
16					16
17					17
18					18
19					19
20					20
21					21
22					22
23					23
24					24
25					25

PROJECT MAD RIVER GLEN COOPERATIVELOCATION FAYSTON, VERMONTDATE DRILLED 12/3/96 TOTAL DEPTH OF HOLE 12.0'

DIAMETER _____

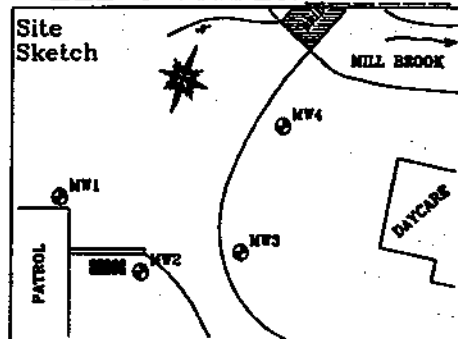
SCREEN DIA. 2" LENGTH 7.0' SLOT SIZE 0.010"CASING DIA. 2" LENGTH 2.5' TYPE sch 40 pvcDRILLING CO. GMB DRILLING METHOD HSADRILLER RON GARNEAU LOG BY E. SANDBLOMWELL NUMBER MW2

GRIFFIN INTERNATIONAL, INC

DEPTH IN FEET	WELL CONSTRUCTION	NOTES	BLOWS PER 6" OF SPOON & PID READINGS	DESCRIPTION/SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)	DEPTH IN FEET
0	ROAD BOX	LOCKING WELL CAP			0
1	CONCRETE				1
2	NATIVE BACKFILL		0'-5' 0.6 ppm	Dry, brown, silty SAND with trace of fine gravel.	2
3	BENTONITE				3
4	WELL RISER			4.0' WATER TABLE	4
5	SAND PACK				5
6	WELL SCREEN		5'-7'- 4/3/6/6 5.9 ppm	Saturated, brown, fine to medium coarse SAND and SILT with gravel.	6
7					7
8					8
9	BOTTOM CAP				9
10					10
11			10'-12'- 3/6/6/12 6.0 ppm	Saturated, very fine SAND, SILT and CLAY, trace of gravel.	11
12	UNDISTURBED NATIVE SOIL			BASE OF WELL AT 10.0' END OF EXPLORATION AT 12.0'	12
13					13
14					14
15					15
16					16
17					17
18					18
19					19
20					20
21					21
22					22
23					23
24					24
25					25

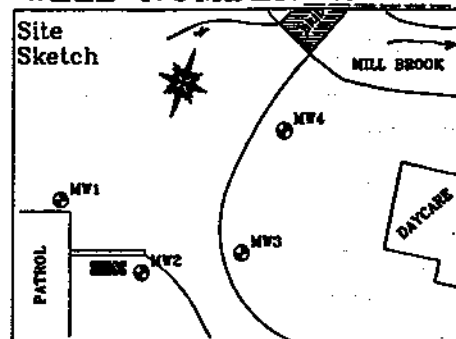
PROJECT MAD RIVER GLEN COOPERATIVELOCATION FAYSTON, VERMONTDATE DRILLED 12/3/96 TOTAL DEPTH OF HOLE 12.0'

PARAMETER _____

SCREEN DIA. 2" LENGTH 10.0' SLOT SIZE 0.010"CASING DIA. 2" LENGTH 1.5' TYPE sch 40 pvcMILLING CO. GMB DRILLING METHOD HSADRILLER RON GARNEAU LOG BY E. SANDBLOMWELL NUMBER MW3

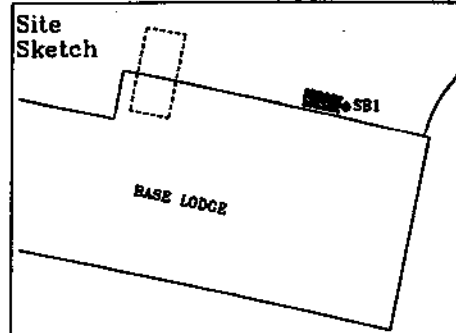
GRIFFIN INTERNATIONAL, INC

DEPTH IN FEET	WELL CONSTRUCTION	NOTES	BLOWS PER 6" OF SPOON & PID READINGS	DESCRIPTION/SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)	DEPTH IN FEET
0		ROAD BOX			0
1		LOCKING WELL CAP			1
2		CONCRETE			2
3		BENTONITE			3
4		WELL RISER			4
5			0'-5' 0.2 ppm	Dry, brown, medium to fine SAND and SILT with gravel.	5
6		SAND PACK		2.5' WATER TABLE	6
7			5'-7'- 15/11/12/13 0.8 ppm	Multi colored, medium to coarse SAND and GRAVEL	7
8		WELL SCREEN			8
9					9
10					10
11		BOTTOM CAP	10'-12'- 10/9/6/7 0.2 ppm	Saturated, brown, fine SAND, SILT and CLAY with trace of fine gravel.	11
12		UNDISTURBED NATIVE SOIL		BASE OF WELL AT 12.0'	12
13				END OF EXPLORATION AT 12.0'	13
14					14
15					15
16					16
17					17
18					18
19					19
20					20
21					21
22					22
23					23
24					24
25					25


PROJECT MAD RIVER GLEN COOPERATIVELOCATION FAYSTON, VERMONTDATE DRILLED 12/3/96 TOTAL DEPTH OF HOLE 12.0'DIAMETER SCREEN DIA. 2" LENGTH 7.0' SLOT SIZE 0.010"CASING DIA. 2" LENGTH 2.5' TYPE sch 40 pvcDRILLING CO. GMB DRILLING METHOD HSADRILLER RON GARNEAU LOG BY E. SANDBLOMWELL NUMBER MW4

GRIFFIN INTERNATIONAL, INC

DEPTH IN FEET	WELL CONSTRUCTION	NOTES	BLOWS PER 6" OF SPOON & PID READINGS	DESCRIPTION/SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)	DEPTH IN FEET
0	ROAD BOX	LOCKING WELL CAP			0
1	CONCRETE				1
2	BENTONITE		0'-5' 0.4 ppm	Medium to fine SAND and SILT with trace of fine gravel.	2
3	WELL RISER				3
4					4
5	SAND PACK				5
6			5'-7'- 9/4/15/100 1.2 ppm	Well sorted, fine, medium and coarse SAND, some gravel and trace of silt. 6.5' WATER TABLE	6
7	WELL SCREEN				7
8					8
9	BOTTOM CAP				9
10					10
11	BEDROCK		10'-10.25' 2.1 ppm	Saturated SAND and SILT with gravel. BASE OF WELL AT 10.0' REFUSAL AT 10.25'	11
12					12
13					13
14					14
15					15
16					16
17					17
18					18
19					19
20					20
21					21
22					22
23					23
24					24
25					25

PROJECT MAD RIVER GLEN COOPERATIVELOCATION FAYSTON, VERMONTDATE DRILLED 12/4/96 TOTAL DEPTH OF HOLE 13.0'DIAMETER SCREEN DIA. NA LENGTH NA SLOT SIZE NACASING DIA. NA LENGTH NA TYPE NADRILLING CO. GMB DRILLING METHOD HSADRILLER RON GARNEAU LOG BY E. SANDBLOMWELL NUMBER SB1

GRIFFIN INTERNATIONAL, INC

DEPTH IN FEET	WELL CONSTRUCTION	NOTES	BLOWS PER 6" OF SPOON & PID READINGS	DESCRIPTION/SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)	DEPTH IN FEET
0					0
1				Dry, brown, medium to fine SAND and SILT with trace of gravel.	1
2					2
3					3
4					4
5					5
6		NATIVE BACKFILL	5'-7'- 2/1/1/1	No recovery.	6
7					7
8			7'-9' 0 ppm	Saturated, medium to fine GRAVEL various rock types, till, with silt.	8
9					9
10			9'-11'- 12/37/34/38 0.2 ppm	Various fine to medium, whole and fragmented GRAVEL and very fine SAND and SILT.	10
11					11
12			11'-13'- 73/69/49/84 11.5'- 0 ppm 13.0'- 0.2 ppm	12.0' WATER TABLE 	12
13		UNDISTURBED NATIVE SOIL		Stratified, orange/gray crushed ROCK with quartz over saturated silty sand.	13
14				END OF EXPLORATION AT 13.0'	14
15					15
16					16
17					17
18					18
19					19
20					20
21					21
22					22
23					23
24					24
25					25

APPENDIX C

GROUNDWATER QUALITY SUMMARY DATA

Groundwater Quality Data Summary

Mad River Glen Coop

Fayston, Vermont

Monitoring Well 1 (MW-1)

PARAMETER	Date of Sample Collection					
	12/12/96					
Benzene	ND < 1					
Chlorobenzene	ND < 1					
1,2 - Dichlorobenzene	ND < 1					
1,3 - Dichlorobenzene	ND < 1					
1,4 - Dichlorobenzene	ND < 1					
Ethylbenzene	ND < 1					
Toluene	ND < 1					
Xylenes	ND < 1					
Total BTEX	0.0					
MTBE	ND < 10					
BTEX+MTBE	0.0					

Monitoring Well 2 (MW-2)

PARAMETER	Date of Sample Collection					
	12/12/96					
Benzene	ND < 1					
Chlorobenzene	ND < 1					
1,2 - Dichlorobenzene	ND < 1					
1,3 - Dichlorobenzene	ND < 1					
1,4 - Dichlorobenzene	ND < 1					
Ethylbenzene	ND < 1					
Toluene	ND < 1					
Xylenes	ND < 1					
Total BTEX	0.0					
MTBE	ND < 10					
BTEX+MTBE	0.0					

Monitoring Well 3 (MW-3)

PARAMETER	Date of Sample Collection					
	12/12/96					
Benzene	TBQ < 1					
Chlorobenzene	ND < 1					
1,2 - Dichlorobenzene	ND < 1					
1,3 - Dichlorobenzene	ND < 1					
1,4 - Dichlorobenzene	ND < 1					
Ethylbenzene	ND < 1					
Toluene	TBQ < 1					
Xylenes	2.3					
Total BTEX	2.3					
MTBE	ND < 10					
BTEX+MTBE	2.3					

All values reported in ug/L (ppb)
ND - Non Detect

TBQ - Trace Below Quantitation Limit

Groundwater Quality Data Summary

Mad River Glen Coop

Fayston, Vermont

Monitoring Well 4 (MW-4)

PARAMETER	Date of Sample Collection					
	12/12/96					
Benzene	TBQ < 1					
Chlorobenzene	ND < 1					
1,2 - Dichlorobenzene	ND < 1					
1,3 - Dichlorobenzene	ND < 1					
1,4 - Dichlorobenzene	ND < 1					
Ethylbenzene	ND < 1					
Toluene	1.1					
Xylenes	ND < 1					
Total BTEX	1.1					
MTBE	ND < 10					
BTEX+MTBE	1.1					

Base Box SW

PARAMETER	Date of Sample Collection					
	12/12/96					
Benzene	ND < 1					
Chlorobenzene	ND < 1					
1,2 - Dichlorobenzene	ND < 1					
1,3 - Dichlorobenzene	ND < 1					
1,4 - Dichlorobenzene	ND < 1					
Ethylbenzene	ND < 1					
Toluene	ND < 1					
Xylenes	ND < 1					
Total BTEX	0.0					
MTBE	ND < 10					
BTEX+MTBE	0.0					

Patrol/Nursery SW

PARAMETER	Date of Sample Collection					
	12/12/96					
Benzene	ND < 1					
Chlorobenzene	ND < 1					
1,2 - Dichlorobenzene	ND < 1					
1,3 - Dichlorobenzene	ND < 1					
1,4 - Dichlorobenzene	ND < 1					
Ethylbenzene	ND < 1					
Toluene	ND < 1					
Xylenes	ND < 1					
Total BTEX	0.0					
MTBE	ND < 10					
BTEX+MTBE	0.0					

All values reported in ug/L (ppb)
ND - Non Detect

TBQ - Trace Below Quantitation Limit

1/10/97

Groundwater Quality Data Summary **Mad River Glen Coop** **Fayston, Vermont**

**Vermont Drinking Water Standards and
Quality Assurance and Control Samples**

Sample Date: December 12, 1996

PARAMETER	Equipment Blank	Trip Blank	Duplicate (MW-2)	Vermont Drinking Water Standards
Benzene	N/A	ND < 1	ND < 1	5.0*
Chlorobenzene	N/A	ND < 1	ND < 1	100*
1,2 - Dichlorobenzene	N/A	ND < 1	ND < 1	600*
1,3 - Dichlorobenzene	N/A	ND < 1	ND < 1	600**
1,4 - Dichlorobenzene	N/A	ND < 1	ND < 1	75*
Ethylbenzene	N/A	ND < 1	ND < 1	700*
Toluene	N/A	1.1	ND < 1	1,000*
Xylenes	N/A	TBQ < 1	ND < 1	10,000*
Total BTEX	N/A	1.1	0.0	
MTBE	N/A	ND < 10	ND < 10	40**
BTEX+MTBE	N/A	1.1	0.0	

All values reported in ug/L (ppb)
ND - Non Detect

TBQ - Trace Below Quantitation Limit

APPENDIX D

SOIL SAMPLE ANALYSIS DATA SUMMARY

1/10/97

Soil Sample Analysis Data Summary **Mad River Glen Coop** **Fayston, Vermont**

SB-1 (12' Below Ground Surface)

PARAMETER	Date of Sample Collection						
	12/4/96						
Benzene	ND < 51						
Chlorobenzene	ND < 51						
1,2 - Dichlorobenzene	ND < 51						
1,3 - Dichlorobenzene	ND < 51						
1,4 - Dichlorobenzene	ND < 51						
Ethylbenzene	ND < 51						
Toluene	ND < 51						
Xylenes	ND < 51						
Total BTEX	0.0						
MTBE	ND < 510						
BTEX+MTBE	0.0						

All values reported in ug/L (ppb)
 ND - Non Detect

TBQ - Trace Below Quantitation Limit

APPENDIX E

GROUNDWATER LIQUID LEVEL DATA

1/10/97

Liquid Level Monitoring Data
Mad River Glen Coop
Fayston, Vermont

Monitoring Date:
12-Dec-96

Well I.D.	Well Depth	Top of Casing Elevation	Depth to Product	Depth to Water	Product Thickness	Specific Gravity of Product	Hydro Equivalent	Corrected Depth to Water	Corrected Water Table Elevation
MW-1	12.50	100.00	-	7.42	-	-	-	7.42	92.58
MW-2	10.00	101.49	-	3.82	-	-	-	3.82	97.67
MW-3	12.00	98.71	-	2.32	-	-	-	2.32	96.39
MW-4	10.00	95.14	-	6.57	-	-	-	6.57	88.57

All values reported in feet

1/10/97

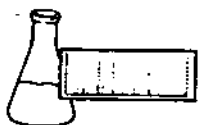
**Historical Groundwater Elevation Data
Mad River Glen Coop
Fayston, Vermont**

Well No.	Monitoring Date:											
	12/12/96											
MW-1	92.58											
MW-2	97.67											
MW-3	96.39											
MW-4	88.57											

All values reported in feet

APPENDIX F

LABORATORY ANALYSIS REPORTS



ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

REPORT OF LABORATORY ANALYSIS

CLIENT: Griffin International
PROJECT NAME: Mad River Glen Coop
REPORT DATE: December 18, 1996
DATE SAMPLED: December 12, 1996

PROJECT CODE: GIMR1309
REF.#: 97,850 - 97,857

Enclosed please find the results of the analyses performed for the samples referenced on the attached chain of custody. Chain of custody indicated sample preservation with HCl.

All samples were prepared and analyzed by requirements outlined in the referenced method and within the specified holding times. All instrumentation was calibrated with the appropriate frequency and verified by the requirements outlined in the referenced method. Blank contamination was not observed at levels affecting the analytical results.

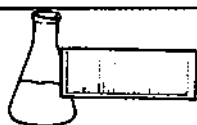
Analytical method precision and accuracy was monitored by laboratory control standards which included matrix spike, duplicate and quality control analyses. These standards were determined to be within established laboratory method acceptance limits.

Individual sample performance was monitored by the addition of surrogate analytes to each sample. All surrogate recovery data was determined to be within laboratory QA/QC guidelines unless otherwise noted.

Reviewed by,

Harry B. Locker, Ph.D.
Laboratory Director

enclosures

**ENDYNE, INC.****Laboratory Services**

32 James Brown Drive
 Williston, Vermont 05495
 (802) 879-4333
 FAX 879-7103

EPA METHOD 602--PURGEABLE AROMATICS**CLIENT:** Griffin International**DATE RECEIVED:** December 12, 1996**PROJECT NAME:** Mad River Glen Coop**REPORT DATE:** December 18, 1996**CLIENT PROJ. #:** 11964945**PROJECT CODE:** GIMR1309

Ref. #:	97,850	97,851	97,852	97,853	97,854
Site:	Trip Blank	MW-1	MW-2	MW-3	MW-4
Date Sampled:	12/12/96	12/12/96	12/12/96	12/12/96	12/12/96
Time Sampled:	8:12	10:08	10:10	10:05	9:56
Sampler:	E.S./S.B.	E.S./S.B.	E.S./S.B.	E.S./S.B.	E.S./S.B.
Date Analyzed:	12/17/96	12/16/96	12/16/96	12/17/96	12/17/96
UIP Count:	0	0	0	5	4
Dil. Factor (%):	100	100	100	100	100
Surr % Rec. (%):	92	95	95	96	94
Parameter	Conc. (ug/L)	Conc. (ug/L)	Conc. (ug/L)	Conc. (ug/L)	Conc. (ug/L)
Benzene	<1	<1	<1	TBQ <1	TBQ <1
Chlorobenzene	<1	<1	<1	<1	<1
1,2-Dichlorobenzene	<1	<1	<1	<1	<1
1,3-Dichlorobenzene	<1	<1	<1	<1	<1
1,4-Dichlorobenzene	<1	<1	<1	<1	<1
Ethylbenzene	<1	<1	<1	<1	<1
Toluene	1.1	<1	<1	TBQ <1	1.1
Xylenes	TBQ <1	<1	<1	2.3	<1
MTBE	<10	<10	<10	<10	<10

Ref. #:	97,855	97,856	97,857		
Site:	Duplicate	Patrol SW	Base Box SW		
Date Sampled:	12/12/96	12/12/96	12/12/96		
Time Sampled:	10:10	11:25	11:31		
Sampler:	E.S./S.B.	E.S./S.B.	E.S./S.B.		
Date Analyzed:	12/16/96	12/16/96	12/16/96		
UIP Count:	0	0	0		
Dil. Factor (%):	100	100	100		
Surr % Rec. (%):	96	96	96		
Parameter	Conc. (ug/L)	Conc. (ug/L)	Conc. (ug/L)		
Benzene	<1	<1	<1		
Chlorobenzene	<1	<1	<1		
1,2-Dichlorobenzene	<1	<1	<1		
1,3-Dichlorobenzene	<1	<1	<1		
1,4-Dichlorobenzene	<1	<1	<1		
Ethylbenzene	<1	<1	<1		
Toluene	<1	<1	<1		
Xylenes	<1	<1	<1		
MTBE	<10	<10	<10		

Note: UIP = Unidentified Peaks TBQ = Trace Below Quantitation NI = Not Indicated

1196445

Project Name: <u>Red River Glen Coals</u> Site Location: <u>Fayston, VT</u>	Reporting Address: <u>Griffin</u>	Billing Address: <u>Griffin</u>
Endyne Project Number: <u>GIMR1309</u>	Company: <u>Griffin</u> Contact Name/Phone #: <u>E. Sandblom</u>	Sampler Name: <u>E. Sandblom / B. Bombardier</u> Phone #: <u>805-4288</u>

[illegible]

Relinquished by: Signature

Received by: Signature

Date/Time

Relinquished by: Signature

Received by: Signature

Date/Time

New York State Project: Yes ☐ No ☒

Requested Analyses

[illegible]



ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

REPORT OF LABORATORY ANALYSIS

CLIENT: Griffin International
PROJECT NAME: Mad River Glen Coop
REPORT DATE: December 13, 1996
DATE SAMPLED: December 3, 1996

PROJECT CODE: GIMR1198
REF.#: 97,541

Enclosed please find the results of the analyses performed for the samples referenced on the attached chain of custody. Chain of custody indicated proper sample preservation.

All samples were prepared and analyzed by requirements outlined in the referenced method and within the specified holding times. All instrumentation was calibrated with the appropriate frequency and verified by the requirements outlined in the referenced method. Blank contamination was not observed at levels affecting the analytical results.

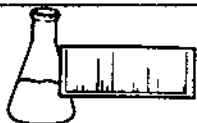
Analytical method precision and accuracy was monitored by laboratory control standards which included matrix spike, duplicate and quality control analyses. These standards were determined to be within established laboratory method acceptance limits.

Individual sample performance was monitored by the addition of surrogate analytes to each sample. All surrogate recovery data was determined to be within laboratory QA/QC guidelines unless otherwise noted.

Reviewed by,

Harry B. Locker, Ph.D.
Laboratory Director

enclosures



ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

EPA METHOD 602--PURGEABLE AROMATICS

CLIENT: Griffin International

DATE RECEIVED: December 4, 1996

PROJECT NAME: Mad River Glen Coop

REPORT DATE: December 13, 1996

CLIENT PROJ. #: NI

PROJECT CODE: GIMR1198

Ref. #:	97,541				
Site:	SB1 12' BGS				
Date Sampled:	12/4/96				
Time Sampled:	10:04				
Sampler:	E. Sandblom				
Date Analyzed:	12/13/96				
UIP Count:	0				
Solids (%):	87				
Surr % Rec. (%):	107				
Parameter	ug/kg, wet wt.				
Benzene	<51				
Chlorobenzene	<51				
1,2-Dichlorobenzene	<51				
1,3-Dichlorobenzene	<51				
1,4-Dichlorobenzene	<51				
Ethylbenzene	<51				
Toluene	<51				
Xylenes	<51				
MTBE	<510				

Note: UIP = Unidentified Peaks TBQ = Trace Below Quantitation NI = Not Indicated

